

CLAIMS

1. A brake control system, comprising:
 - a first pair of brake control units;
 - a second pair of brake control units;
 - a first brake control bus which is operatively connected to each of the
 - 5 respective ones of said first pair of brake control units;
 - a second brake control bus which is operatively connected to each of the
 - respective ones of said second pair of brake control units;
 - a first supervisory controller which is operatively connected to said first brake
 - 10 control bus and adapted to control each of the respective ones of
 - said first brake control unit pair through said first control bus;
 - a second supervisory controller which is operatively connected to said second
 - brake control bus and adapted to control each of the respect ones of
 - said second brake control unit pair through said second control bus;
 - a controller bus which is operatively connected to each of said first
 - 15 supervisory controller and said second supervisory controller; and
 - a monitoring controller which is operatively connected to said controller bus
 - and adapted to monitor the performance of said first supervisory
 - controller, said second supervisory controller, said first brake
 - control bus, and said second brake control bus.
2. The brake control system of claim 1, further comprising a brake
 - control cutoff module, said module operatively connected by at least one
 - controller signal line to said monitoring controller, said module also
 - operatively connected by a first brake control line to said first pair of brake
 - 5 control units and by a second brake control line to said second pair of brake
 - control units, wherein said brake control cutoff module is adapted to receive a
 - control input signal from said monitoring controller and selectively provide a
 - control output signal to one of said first brake control unit pair and said second

brake control unit pair, and wherein the control output signal comprises a
10 cutoff command to the one of said pairs receiving the control output signal.

3. The brake control system of claim 2, wherein the brake control cutoff module comprises a latching relay having embedded control logic to control the latching of the relay.

4. The brake control system of claim 3, wherein the control output signal is selectively provided to one of said first pair of brake control units and said second pair of brake control units in accordance with the control logic.

5. The brake control system of claim 4, wherein the at least one signal line comprises a first logic line and a second logic line, and wherein the first logic line may be selectively operatively connected through the control logic to the first brake control line and the second logic line may be selectively
5 operatively connected through the logic to the second brake control line.

6. The brake control system of claim 1, further comprising a brake control cutoff module, said module operatively connected by at least one controller signal line to said monitoring controller, said module also operatively connected by a first brake control line to a first bus control which
5 is operatively connected to said first brake bus and by a second brake control line to a second bus control which is operatively connected to said second brake bus, wherein said brake control cutoff module is adapted to receive a control input signal from said monitoring controller and selectively provide a control output signal to one of said first bus control and said second bus
10 control, and wherein the control output signal comprises a cutoff command to the one of said first bus control and said second bus control receiving the control output signal.

7. The brake control system of claim 6, wherein the brake control cutoff module comprises a latching relay having embedded control logic to control the latching of the relay.

8. The brake control system of claim 7, wherein the control output signal is selectively provided to one of said first bus control and said second bus control in accordance with the control logic.

9. The brake control system of claim 8, wherein the at least one signal line comprises a first logic line and a second logic line, and wherein the first logic line may be selectively operatively connected through the control logic to the first brake control line and the second logic line may be selectively
5 operatively connected through the control logic to the second brake control line.

10. The brake control system of claim 1, further comprising a means for selectively disabling one of said first pair of brake control units and said second pair of brake control units, said means in signal communication with said monitoring controller, said means connected by a first signal line to
5 and in signal communication with said first pair of brake control units and connected by a second signal line to and in signal communication with said second pair of brake control units, said means adapted to receive a control input signal from said monitoring controller and communicate a control output signal in response thereto to disable one of said first brake control unit pair
10 and said second brake control unit pair.

11. The brake control system of claim 1, wherein said monitoring controller is adapted to provide a warning indication to an operator in the event that one of said first brake control unit pair and said second brake control unit pair is disabled.

12. The brake control system of claim 1, wherein said first supervisory controller and said monitoring controller comprise a first fail-silent pair and said second supervisory controller and said monitoring controller comprise a second fail-silent pair.

13. The brake control system of claim 1, further comprising:
a first brake sensor that is operatively connected to a brake actuation device
and adapted to sense an operator input and provide a first
unprocessed brake signal,
5 a second brake sensor that is operatively connected to the brake actuation
device and adapted to sense the operator input and provide a second
unprocessed brake signal;
a third brake sensor that is operatively connected to the brake actuation device
and adapted to sense the operator input and provide a third
10 unprocessed brake signal;
a brake actuation module that is adapted to receive the first unprocessed brake
signal, second unprocessed brake signal and third unprocessed
brake signal and process these output signals to provide a processed
brake signal, wherein said first supervisory controller is adapted to
15 receive the first unprocessed brake signal and the processed brake
signal and is adapted to control said first brake control unit pair in
response thereto, and said second supervisory controller is adapted
to receive the second unprocessed brake signal and the processed
brake signal and is adapted to control said second brake control unit
20 pair in response thereto, and said monitoring controller is adapted to
receive the third unprocessed brake signal and the processed brake
signal.

14. A brake control system, comprising:
a first pair of brake control units;
a second pair of brake control units;

a first brake control bus which is operatively connected to each of the
 5 respective ones of said first pair of brake control units;
 a second brake control bus which is operatively connected to each of the
 respective ones of said second pair of brake control units;
 a first supervisory controller which is operatively connected to said first brake
 control bus and adapted to control each of the respective ones of
 10 said first brake control unit pair through said first control bus;
 a second supervisory controller which is operatively connected to said second
 brake control bus and adapted to control each of the respect ones of
 said second brake control unit pair through said second control bus;
 a controller bus which is operatively connected to each of said first
 15 supervisory controller and said second supervisory controller; and
 a monitoring controller which is operatively connected to said controller bus
 and adapted to monitor the performance of said first supervisory
 controller, said second supervisory controller, said first brake
 control bus, and said second brake control bus; and
 20 a brake control cutoff module, said module operatively connected by at least
 one controller signal line to said monitoring controller, said module
 also operatively connected by a first brake control line to said first
 pair of brake control units and by a second brake control line to said
 second pair of brake control units, wherein said brake control cutoff
 25 module is adapted to receive a control input signal from said
 monitoring controller and selectively provide a control output signal
 to one of said first brake control unit pair and said second brake
 control unit pair, and wherein the control output signal comprises a
 cutoff command to the one of said pairs receiving the control output
 30 signal.

15. The brake control system of claim 14, further comprising:
 a first brake sensor that is operatively connected to a brake actuation device
 and adapted to sense an operator input and provide a first
 unprocessed brake signal,

- 5 a second brake sensor that is operatively connected to the brake actuation device and adapted to sense the operator input and provide a second unprocessed brake signal;
- a third brake sensor that is operatively connected to the brake actuation device and adapted to sense the operator input and provide a third
- 10 unprocessed brake signal;
- a brake actuator module that is adapted to receive the first unprocessed brake signal, second unprocessed brake signal and third unprocessed brake signal and process these output signals to provide a processed brake signal, wherein said first supervisory controller is adapted to
- 15 receive the first unprocessed brake signal and the processed brake signal and is adapted to control said first brake control unit pair in response thereto, and said second supervisory controller is adapted to receive the second unprocessed brake signal and the processed brake signal and is adapted to control said second brake control unit
- 20 pair in response thereto, and said monitoring controller is adapted to receive the third unprocessed brake signal and the processed brake signal.

16. The brake control system of claim 15, wherein said first supervisory controller and said monitoring controller comprise a first fail-silent pair and said second supervisory controller and said monitoring controller comprise a second fail-silent pair.

17. A brake control system, comprising:
- a first pair of brake control units;
- a second pair of brake control units;
- a first brake control bus which is operatively connected to each of the
- 5 respective ones of said first pair of brake control units;
- a second brake control bus which is operatively connected to each of the respective ones of said second pair of brake control units;

a first supervisory controller which is operatively connected to said first brake
 control bus and adapted to control each of the respective ones of
 10 said first brake control unit pair through said first control bus;
 a second supervisory controller which is operatively connected to said second
 brake control bus and adapted to control each of the respect ones of
 said second brake control unit pair through said second control bus;
 a controller bus which is operatively connected to each of said first
 15 supervisory controller and said second supervisory controller;
 a monitoring controller which is operatively connected to said controller bus
 and adapted to monitor the performance of said first supervisory
 controller, said second supervisory controller, said first brake
 control bus, and said second brake control bus; and
 20 a brake control cutoff module, said module operatively connected by at least
 one controller signal line to said monitoring controller, said module
 also operatively connected by a first brake control line to a first bus
 control which is operatively connected to said first brake bus and by
 a second brake control line to a second bus control which is
 25 operatively connected to said second brake bus, wherein said brake
 control cutoff module is adapted to receive a control input signal
 from said monitoring controller and selectively provide a control
 output signal to one of said first bus control and said second bus
 control, and wherein the control output signal comprises a cutoff
 30 command to the one of said first bus control and said second bus
 control receiving the control output signal.

18. The brake control system of claim 17, further comprising:

a first brake sensor that is operatively connected to a brake actuation device
 and adapted to sense an operator input and provide a first
 unprocessed brake signal,

- 5 a second brake sensor that is operatively connected to the brake actuation device and adapted to sense the operator input and provide a second unprocessed brake signal;
- a third brake sensor that is operatively connected to the brake actuation device and adapted to sense the operator input and provide a third
- 10 unprocessed brake signal;
- a brake actuator module that is adapted to receive the first unprocessed brake signal, second unprocessed brake signal and third unprocessed brake signal and process these output signals to provide a processed brake signal, wherein said first supervisory controller is adapted to
- 15 receive the first unprocessed brake signal and the processed brake signal and is adapted to control said first brake control unit pair in response thereto, and said second supervisory controller is adapted to receive the second unprocessed brake signal and the processed brake signal and is adapted to control said second brake control unit
- 20 pair in response thereto, and said monitoring controller is adapted to receive the third unprocessed brake signal and the processed brake signal.

19. The brake control system of claim 18, wherein said first supervisory controller and said monitoring controller comprise a first fail-silent pair and said second supervisory controller and said monitoring controller comprise a second fail-silent pair.